Question Number	Answer	Mark
	N.B. Accept column vectors throughout the question	
2(a)	Integrate **both** components of **v**	M1
	$\mathbf{r} = \left(\frac{t^2}{2} - \cos t\right)\mathbf{i} + \left(\sin t - 3t\right)\mathbf{j} \quad (+\mathbf{c})$	A1
	Complete method using $t = 0$ and $\mathbf{r} = 2\mathbf{i}$ to find $\mathbf{r}$ when $t = \pi$:	M1
	$\mathbf{r} = \left(\frac{\pi^2}{2} + 4\right)\mathbf{i} - 3\pi\mathbf{j}$	A1
		(4)
2(b)	Differentiates **both** components of **v**	M1
	$\mathbf{a} = \left(1 + \cos t\right)\mathbf{i} + \left(-\sin t\right)\mathbf{j}$	A1
	Use of $\mathbf{F} = m\,\mathbf{a}$ or $F = ma$ and Pythagoras	M1
	$\left\|\mathbf{F}\right\| = 0.5\sqrt{\left(1+\cos t\right)^2 + (-\sin t)^2}$	A1
	Expand and use trig identity to reach given answer $\left\|\mathbf{F}\right\| = \sqrt{\frac{1+\cos t}{2}}$ *	A1*
		(5)
		(9)
	Notes for question	
(a)		
M1	Integrates both components of **v**. At least one power of t must increase by 1 and at least one trig term must change (sin$t$/cos$t$) overall, rather than in each component.	
A1	Correct unsimplified expression. Allow with no constant of integration.	
M1	**N.B**. Must have attempted to integrate. Complete method using $t = 0$ and $\mathbf{r} = 2\mathbf{i}$ to find $\mathbf{r}$ when $t = \pi$ Constant of integration is $3\mathbf{i}$	
A1	Correct answer. Trig values must be evaluated.	
(b)		
M1	Differentiates **both** components of **v**. At least one power of t must decrease by 1 and at least one trig term must change (sin$t$/cos$t$) overall, rather than in each component.	
A1	Correct expression for acceleration	
M1	Use $\mathbf{F} = m\mathbf{a}$ or $F = ma$ and Pythagoras with root. **N.B.** Must have attempted to differentiate **v** to find **a** M0 if only one component of **a** is multiplied by 0.5	
A1	Correct expression	
A1*	Expand and use trig identity to obtain the given answer. **N.B.** Must see $\left\|\mathbf{F}\right\| =$ .. somewhere	